



ON THE NECESSITY OF A SCHOOL OF ARTS FOR THE DOMINION *(Canada)*

A paper read before the Canadian Society of Civil Engineers at their
meeting of the ~~26th~~ May 1887 *Quincy*

During a professional career of now nearly 40 years, I have had to design, estimate and superintend the construction of very many buildings of all kinds, small and large: dwelling houses, churches and presbyteries, the Laval University, colleges, convents, asylums, hospitals, hotels, schools, theatres, manufactories, &c.; and engaged as I have been on hundreds of arbitration cases relating to defects of construction, in various structures, or in the settlement of untold accounts for extras arising out of faults of omission and commission on part of architects and so called engineers and others; have had abundant opportunity to notice the great and unpardonable ignorance displayed in scores of instances, of the simplest rules of the constructive art.

A paper of this nature would no doubt be more apropos if read before and to be discussed by a society of architects in lieu of one of the engineering profession; but no definite line can well be drawn between the two, and much of what I have to say may be considered common property; for, while the architect often has to be something of an engineer when dealing with foundations built in water; the engineer must also often trench upon the domain of the architect in the erection of bridges and viaducts and in such architectural structures as manufactories and mills, pump and engine houses for water works and other purposes, light houses, grain and other elevators, stores for dockage purposes, railway station buildings and the like.

Hence no apology, I presume, need be offered for my dealing with this subject in presence of an assemblage of men who, like the members of the association of Civil Engineers of Canada, must be often called on to design and erect structures where not only have they to be acquainted with the ordinary and essential rules of construction, but in many cases also of distributive and ornamental architecture; and I hope only to say enough to persuade our legislators of the federal and local parliaments of the absolute necessity, at this stage of the growth and progress of Canada, of the creation of one or more schools of art akin to those of Kensington in London, or to those of St. Cyr, Aix and Angers, in France; where the rising generation of engineers and architects may study and make themselves acquainted with all that is essential to an intelligent appreciation of the necessity of being guided in constructions of all sorts by the well known rules which should be followed out to prevent disaster and the waste of public money, as of private fortunes, in the construction of works which are either totally unsuited to the purposes intended, as is the case with the new harbour works at Quebec, or where the cost incurred has to be incurred again to rectify errors of an engineering or architectural nature.

The Levis graving is dock a case in point, where from not having had the precaution to bore and ascertain the true nature of the foundation on which the structure was to rest, the caisson gate has had to be moved inland by not less than 65 ft., the dock curtailed by that much in its length; and, due to which error, a work undertaken to be built and completed for less than half a million of dollars, now costs close upon double the amount; a single dam, for mere temporary purposes arising out of the unpardonable error of the english engineers employed by the harbour commissioners to design and carry out the work, having cost not less than \$118,000.00.

Is there anything more usual for instance, with a large number of our would be architects and builders than to be totally ignorant of the fact that the strength of a joist or horizontally placed beam is in direct ratio to the square of its depth and indirectly or in the inverse ratio of its length. Do they even know the meaning of these terms; or would they not in so many thousands of existing cases, instead of adding to the breadth or thickness of the beam (because it requires no tuition to understand that) have, in lieu of so doing, increased its depth by only a fraction of the whole; for, while to double the strength of the beam, its depth remaining the same, the breadth must be doubled, the same increment of resistance is added to it by increasing its depth by only 4 tenths thereof or little more than a third of its vertical height. To treble the strength, the advantage gained is even more marked; as in such case it suffices to add, not the double of 4 tenths but little over 7 tenths—73 per cent; and to quadruple the strength, the depth only has to be doubled, so that a 3" x 17" joist for instance is as strong as one of 6" x 12" or as two of 3" x 12" while the increased quantity of timber is but 40 per cent in the one case against 100 per cent in the other; and a 3" x 15" joist, while only 25 per cent more in its cubic contents or board measure, will be 50 per cent stronger than the 3" x 12" timber.

Had this rule been acted on in the past, how many thousands of dollars worth of timber would there not have been saved in the aggregate and each and every one have benefited thereby.

Of course there is a practical limit to thus adding to the height of beam to increase the strength; as, in the case of timber, the deeper beam must be cut from a larger and more expensive log, and if very deep, herring bone bridging must be employed or intermediate strutting, to preserve the verticality of the beam and ensure its not giving laterally. The depth of floors must not be inde-

finitely increased, the height between floors diminished by so much, or the total elevation of the structure added to in a manner to make it more costly or of ungainly aspect.

Again, how often have I not been shocked, on entering even new or comparatively new buildings: dwelling houses by the hundred, stores and factories, and even public buildings; where all the floors were on the slant towards the centre of the building; all the doors, more especially in partitions running from front to rear—less so in the narrower direction between the gable ends or party walls,—on the skew; partly from being forced out of the rectangular, partly from having to be eased off by the joiner from time to time, to cause them to shut and fit their jambs or frames; the furniture of course following suit, with tables on which a round ruler or pencil could not be placed without rolling off; the plastering cracked and broken from the settlement, and the whole defect rendered doubly sensible and more intolerable to the eye by its being thrust on the spectator in the evidently inclined lines to which the paperings or tapestry were cut to conform to the unhorizontal lines of cornices and skirtings.

The first, the extra cost of beams is a defect only of a pecuniary nature so to say and being hidden beneath the floors is soon and easily forgotten; but not so this, which to a sensitive and appreciative eye can not but be a lasting and continuous source of bodily inconvenience and mental agony.

And all this due to what? to sheer ignorance of the fact that of three points of support, the centre one bears double the weight of either of the others when placed half way between them.

Now not only are the division walls of thousands of buildings, not stronger in proportion to the outer walls, as they should be; but they are on the contrary not half so thick or strong, and worse than all, what do we find in most tenement houses, but a mere partition of light wooden studs and lath and plaster with sometimes not even a foundation wall in or below the basement floor for this partition to rest on, or if there be one the chances are that it is not even on an unyielding foundation; and thus, between the sinking into the soil, the crushing of the superposed horizontal timbers between the tiers of studs, due to weight of structure and to shrinkage from drying or desiccation, amounting to as much as an inch or more in each story; the settlement occurs which I have alluded to, and either hundreds or thousands have to be expended in rectifying this error of construction often due to the parsimoniousness and ignorance of the proprietor himself, and in total disregard for the advice of his architect or builder; or the structure remains a crying disgrace and reproach to all concerned in its erection and a source of every day discomfort and torment, as every thing unaesthetical generally is to all people of fine and cultivated feelings.

But there has also to be guarded against the sagging of a floor between the two or four walls; and to this purpose it often suffices to remember that every joist, as far as possible, or at least every second or alternate one should stretch right through the structure from front to rear and so rest on all three the walls, the centre one as well as the two outer; that is, on three points of support.

The strength of a joist is thus doubled and its tendency to sag at the centre of the vacant space reduced by 50 per cent; its stiffness, as already said, being in the inverse ratio of its length; nor must it be forgotten that when no more than two points of support can be had, or the beam not long enough to reach the full depth, then may its rigidity be increased 25 % by thoroughly sealing it at one end in the wall and by not less than 50 % when similarly sealed at both ends; not forgetting neither, that whatever weight the beam will bear at its centre, it will bear twice the weight when uniformly distributed throughout its length.

My advice, is Gentlemen: design the thing as it should be, and so specify the work; and let the paper writing there remain, as well the plans and sections, to show and prove that you proposed what you considered right and essential; and then leave it to the proprietor, if so he should elect, to cut and curtail as he may please, to thin out the walls for sake of false economy, shorten the joists or reduce their height.

I have had examples of this more than once in my own practice. When not much more than a boy, just out of indentures, I was called on to design the plans for the parish church of Beauport, near Quebec. Each of the towers I planned to have 4 walls: in fact to make towers of them from below to the base of the spire, the steeples reaching as they do to a height of over 200 ft. The church wardens in their economical wisdom decided on leaving out the two inner walls of each of the towers, and supporting the corresponding sides of the spires on a single angle pillar or rather post of timber.

The consequence is that both the steeples settled towards each other and towards the building and that being thereafter called on by a then new curate and new set of wardens to rectify the error; I was reproached with not having at the outset properly designed the structure, until the very plans I had prepared some 20 years before were produced by me to show that not I was at fault, but the parishioners themselves in the wrong.

Nothing is more difficult for instance than to get a proprietor or even a municipality represented in its city council by illiterate men, to allow an engineer or architect to build a retaining wall of sufficient strength, sufficiently thick at bottom to hold out as it should do for its natural life against the horizontal thrust and overturning tendency of the material behind it, often so liquid, so fluid I should say, when composed of quick sand or of water diluted earth, as to have to be assimilated in stress to that of water pressure for purposes of calculation.

I have not always been faultless myself in this respect, wishing to economise the straightened means of such a poverty stricken place as old Quebec; but have long found out that it is all false economy and that far better be it to design and build any such wall of a greater rather than a less thickness, than be taunted with and thereafter made to feel keenly the justness of the reproach of not having done so and see the structure giving way little by little towards the open, first gradually losing its batter, if any, reaching the vertical and then in course of time leaning forward and finally in from 10 to 20 years threatening destruction, when its natural life should have been at least a hundred years or more if kept in proper repair. But retaining walls will do this, due to other causes to be guarded against and no matter how thick they be and well adapted to sustain and resist the thrust: I mean from the effects of frost when not filled in in the rear with permeable material, as they should invariably be, to allow surface or other waters to pass off through weepers below to the street level.

There are other defects to be guarded against, as the bulging out of walls of certain structures, by the stress of vaults and arches where not counteracted either by a proper thickness of wall or by the strengthening thereof by buttresses, or loading from above by adding to the height, or applying iron ties to counteract the spreading tendency; to say nothing of the very bad effect of the appearance of a corner pier of any building when as is often the case it is made narrower than the intermediate ones between the openings; as when in an isolated dwelling house or other building, a narrow passage way along the gable of the same throws the door so close to the end as barely to leave more between it and the angle than the mere thickness of the wall itself, a defect which should not be tolerated, but the door shifted further from the end even at the expense of widening the passage, trenching on the room adjoining or the less objectionable mode of encroaching a little on the front portion of the room and hiding the defect from the inside by an angular or quadrantal projection within the apartment.

Gentlemen, there is in our human nature an element of aestheticism. Certain proportions seem to be innate in our minds, and existing there, irrespective of any tuition of the beautiful, they are so to say engraven on the retina of the eye and thus rendered indissoluble. Likely this is due to the ratios in the human nature. You can notice this when ever an illiterate man or child will say that such and such a thing does not please him, as for instance when a building is top heavy: that it looks like a man whose head rests almost on his shoulders without the interposition of a neck.

We all appreciate the true proportions of a human being, man or child or woman. One is said to be too bulky for his height, too short, too stumpy, another too tall and slight. We do not like, we can not bear to see a waist half way down the body, of which the normal height is at say two thirds, from the ground or floor we stand on.

Our elue is taken from this, it is implanted in us by the creator and hence it is I believe that without knowing why, no one almost there is but who dislikes to see a column for instance cut or divided through the centre, or its middle pointed at by an abutting cornice, or plinth course, or by the head or transom of a door or gate way or by the impost of an arched opening or by a nich of which either the top or bottom comes opposite the centre. On the contrary if any such adjoining feature cuts the column or abuts against it at just two thirds the height from base one feels satisfied that the right proportions are observed.

Why are the fillets in the flutings of a column made just one third the height of shaft. Try them at $\frac{1}{2}$ the height and some how or other you will not feel satisfied. Put two such columns side by side, one of which the flutes are filled in to half, the other to one third the height and even the untutored eye will select the latter.

Have you ever seen a spire where if the height of angle minarets do vary by less than the two thirds from the total height of structure, it is pleasing to the eye. No, the pinnacle must be one third the height of steeple or thereabout and any attempt to alter it materially is destructive of the effect.

In this way also or due to the same sense, the same innate aestheticism of our human nature, can we account I believe for the fact that a basement floor should be, some two thirds of the joint height of the two stories over it and an attic story two thirds only of the story which it crowns; the attic window also, I do not here allude of course to the dormer or so called attic window in a roof so much as to what is called in classic architecture an attic, that is the upper portion or story of the front elevation of a building; I say an attic window also or that in a regular attic story is looked for as having to be not one half or one third the height of the windows in the regular stories below it; but almost invariably some two thirds thereof to be unoffending, agreeable to the eye.

A door must also be in some way proportionate to the human frame when properly attired, as of a woman with her skirts, say in height from two and a half to three times its width and never its width anything like equal to its height.

A room is not satisfactory, it will please no one, not even those who are incapable of knowing why or of giving expression to their dislike unless its length does bear a certain proportion to its breadth as that of 3 to 2 for instance and the height must bear about the same ratio to the breadth to be agreeable, as 10 to 12 ft. for a 15 ft. room, 20 ft. for a 30 ft. room and so on in proportion.

We have a sad example of this want of relationship in our new parliament buildings Quebec where the rooms on either side the corridor are but 15 ft. in depth from front to rear, so that the windows being say at 10 ft. centres and when three or more of them are thrown into one apartment or to speak more correctly, the apartment made to include that many openings, thus making the room some 30 to 40 ft. or more in length, which it must needs be for many purposes, among others for the architects and engineers departments and crown lands where lengthly space is required for draughtsmen's tables, and the extension of large sized maps, the room becomes a mere gut; whereas, had the depth of building been fixed at 60 ft. instead of 50 which it should have been; then could the rooms, on either side a 10 ft. corridor, have been awarded a breadth of 20 ft. each instead of 15, the remaining 10 ft. being ample for outer and inner walls.

Gentlemen it is, believe me, in no spirit of fault finding that I allude to these defects of construction, distribution, decoration; but it behoves us to educate our youth up to a true aesthetic sentiment, a true appreciation of what is proper; and in the same way as I am now pointing out defects in buildings due to others than myself, so would I at all times be ready to admit the correctness of any such criticism where I have been concerned.

Our new post-office is by general consent deemed top-heavy; that is, there is too much masonry, too great a height of wall above the unduly shortened windows of the attic story; and the contrary defect obtains to some extent in our new court house where there is too little masonry in proportion to the number and size of openings which had they all been curtailed by just one foot in height, would have restored the desired ratio "le rapport entre les pleins et les vides" as they say in French, and may be the mezzanine openings under the roof had better have been omitted or if necessary for light and ventilation, hidden or again as the more characteristic french expression has it "dissimulés" behind some ornamental iron scroll work in imitation of the sculptured frieze of an entablature.

If I allude only to buildings in Quebec and do not reach to Montreal or elsewhere for comparison, it is not that there may not be structures in Montreal or other Canadian or American cities where something may be found to criticize as for instance in the proportions both outward and inward of your Notre-Dame Cathedral or of the stumpy structure adjoining the beautiful grecian portico of the Montreal Bank; but because I have not the buildings as I have those of Quebec in my minds eye, and I think gentlemen, no better paper could be written by any one of you, none invited or solicited from your city architects of more realistic value to the youth of your city than a paper like this, written in a proper spirit and without any desire of fault finding but merely to educate public opinion to a sense of the aesthetic in architecture as in engineering, by pointing out and discussing before your members and the public who may be fortunate enough to attend your sittings, the salient traits of your city architecture both public and domestic, its many beauties and to be eulogised and copied; its fewer or more unnumerous, as the case may be, defects to be avoided.

What would Mansard say if it were given to him to be witness to the many erroneous interpretations of what constitutes the proper proportions of a so called Mansard roof, and in dome construction why depart so widely from the beautiful proportions of the Invalides at Paris.

I will not say with Rory O'Moor that there is luck in odd numbers, though I do not at all pretend to deny the fact; but there seems to be some justification for them even in the Scriptures where periods and epochs whether of weal or woe, famine or abundance are never found in multiples of two but where the odd unit invariably steps in to destroy the monotony, and gentlemen as well in breadth or horizontal magnitude must these proportions be observed as in the vertical.

Try it and vary it as you will, but the tower or the steeple must make some approach towards the one third rule laid down of breadth of portal. Make it much broader and it will not suit, nor can it be much narrower, and in the same way as the breadth of spire must conform to that of the church façade, so must the projecting or recessed central portion of any front elevation of a building, that is, fronting towards a street or even on an inner court, hold some relationship, some near approach to this same ratio of 1 and 2 to 3.

The odd unit is essential in almost every case. Do we not always have an opening, door or window, gateway or the like exactly on the central axis of a building? does it not come natural to do so in all cases, and even in a bridge or viaduct, do we not always seek if possible to have a central span instead of a pier right in the middle of a river or a thoroughfare.

There are defects of space which may be remedied by optical illusion. If a facade be necessarily too low, avoid the too oft repeated horizontal lines of projecting cornices and belt courses, but rather do the contrary and throw it into vertical lines which have the effect of adding materially to the height. The vertical flutings of a column have this effect where any horizontal division of the shaft, any spirally twined ornament around it has the contrary effect.

Nor must we forget to observe the natural in all we do. Not only must a post or column be stout and strong enough to support a structure, but it must appear to be. So when the material for instance is iron, it should be known to be such and painted in a way to show what it is, instead of being made to look like wood or stone and thus create anxiety and doubt as to the fitness of its size, and how often do we not see this elementary rule of ethics outraged by dissimulating the true material under a coat of imitation stone or marble, where such material reduced to so narrow a basis would be obviously inadequate to sustain the weight or even to be self supporting when so reduced in breadth.

Gentlemen, we want a school of arts or more than one where our youth may be educated to the necessity of all these observances and the thousands of dollars lavished in making good the defects of construction I have alluded to would ere this have paid for and maintained many such institutions on a permanent and continuous footing.

As to the sanitary element, made up of drainage, light, ventilation and heating, we are now pretty well off for Canadian and other periodicals dealing with the subject, and I would merely remark on one of these heads: suiting the temperature to the requirements of the outer air, that I do not see why some mode should not be devised to add to our comfort by cooling the inner air in summer in addition to heating it in during cold weather.

For, in the same way that the colder outer air is heated on its way to the interior of a building by being passed over heated pipes; in a similar manner could this outer air, when too warm to suit the human system, be cooled down by passing it over the same pipes then filled with iced water instead of hot, or directly over a bed or stratum of ice; and how efficient this would prove, is evidenced by the fact which many may have often noticed as I have myself, that when on a warm day a breeze or current of air reaches one in the open after passing over the ordinary ice cart when uncovered as we have them in Quebec, the decrease in temperature or coolness of the breeze is thus most marked and agreeable.

And in other ways can the air be cooled as it always is in summer during rainy weather or even during the merest shower, by following the same process, imitating nature in an artificial sprinkling kept up during the hotter hours of the day, or better still when it can be afforded, by artificial rain around the house or opposite a door or window (one or more) by conducting a pipe under sufficient pressure to rise to roof level, so that, perforated along its length like the sprinkler of a watering cart, it may distribute its contents over so much of the eaves as to suit the purposes required.

As to fire proofing I would merely remark that the subject is most pertinent and it is satisfactory to see that a very free use is beginning to be made of iron joists and concrete floors; nor can we reasonably hope for much more than this, with brick partitions instead of wood and lath and plaster ones, as no one will ever consent to dwell or even pass his office hours within a building entirely of stone and brick and iron; no one will put up with any such permanent and continuous discomfort for the sake of an eventuality which may never occur or so seldom as not to warrant the expense of iron floors and stairs and doors and window sashes and their trimmings thus surrounding one with their chilling influences.

May be the most portentous question of all, now a days, is that of the possibility of escape from a building in case of fire, but I shall not allude to it at present as I am about to read a paper on the subject at the next sitting of the Royal Society of Canada of which I am a member and as such bound to contribute my quota towards the Society's yearly volume of transactions. This paper I shall thereafter have much pleasure in repeating the lecture of before the Canadian Society of Engineers and Architects and only hope you may abet me, one and all, in my endeavour to have the Legislature step in and enforce the erection of fire proof buildings for hotels and theatres, colleges, asylums, manufactories and the like; that is to the extent I have alluded to of iron joists and concrete filling in between them with brick partition walls and some thoroughly practical and efficient mode of escape in case of fire, a social and humanitarian proposition of the first importance.

Gentlemen at this stage in our country's growth and progress, we do not want to go abroad for hints or help. We are now so old as to be self sufficient in the building line at least. Montreal, and I am proud to proclaim it thus publicly, can now manufacture almost anything from a needle to an anchor as the saying is. The several cities and towns of the Dominion have their engineers and architects equal to all and every emergency, and if any one city has not its due proportion of capacity in this respect, it can get it from a sister town of the Dominion or from our kind neighbours of the American Union and not have to cross an ocean for the purpose.

Even at the time we built the Victoria, our Keefers and other engineers were totally adequate to the task, but of course English capitalists were concerned and some one had to be sent out from England for the purpose. Let me hope however gentlemen that there will now be an end to all this kind of thing. America has outstripped Europe in very many things, quite long ago, and to proof: the 800 ft. span railway bridge across the Niagara river, the more stupendous bridge of not less than 1600 ft. span between New-York and Brooklyn, our railroads counting their miles by thousands, with the many wide spanned cantilever bridges reaching from cliff to cliff over rivers and ravines innumerable and of untold depth.

Need I in this respect allude to aught else than our inland system of water communication. It is not merely equal but superior to any thing in the old world. Our Canadian engineers have not been slow to frame their minds, their conceptions and their works on the same vast scale on which our inland waters were presented to them. European engineering has been dwarfed so to say, on kept down in scale by not having the opportunities we have here of dealing with a mighty river like St-Lawrence.

It is a true saying that occasion makes the man and gentlemen I proclaim it loudly and most fearlessly of contradiction: had our Keefers or our Shanlys, our Flemings, Lights, our Kennedys, our Schreibers, Pages, Perly's, and the like, been consulted or called in to pronounce upon the respec-

tive merits of the plans submitted for our Quebec Harbour works, or any one of them employed to design and superintend the construction of the works, we would not now have the total failure which we must chronicle to day : a so called dock, a tidal and an inner or a wet dock, where, after expending millions, one of our ocean steamers will not dare to enter from sheer want of length and breadth and depth enough to move about in ; with no facilities for deepening, unless as M. Perly says, beginning at some 40 ft distance from the surrounding walls ; no lock as there necessarily should have been to provide for entrance and exit at any stage of tide or even to make good the difference of several feet between two successive tides ; thus, may be, keeping a steamer otherwise ready for its ocean voyage, waiting several days for the tide to rise sufficiently to let it out ; or having to fall back on the other alternative of letting out the water from the dock until its level is reduced to that of the tidal dock or river, and thereby may be grounding many of the deeper draught of vessels inside of the enclosure.

Gentlemen, one and all of you, let me ask you when you visit our poor misguided city, let me ask you to look down at these so called harbor works from the heights of our ramparts and I tell you that your heart will bleed at the dire sight of the most profound stupidity that the world has ever been witness to. There will you see outstretched before you the comparatively vast extent of the estuary or delta of the St. Charles, and there will you wonder in amazement and ask yourselves why in common sense this long this costly jetty called the Louise embankment was not shifted Northward by many hundred feet thus affording water space within, more than three times the extent it is.

You will see that had this been done, with the very same length and therefore no increased cost of jetty, a quarter of a million dollars more would have sufficed to prolong the then existing breakwater wharf to meet the jetty northward ; while now, not to treble the space as could then have been done, but only to add to it by an insignificant percentage, some 15 to 20 per cent at the most, M. Perly tell us that the cost of purchasing the private property necessary to that end, over three quarters of a million of dollars, together with a million more for a dock wall on the southern side will not be less than 1½ to 2 million dollars instead of the quarter of a million alluded to.

The shifting of the stone jetty so much further northward as it should have been, would have allowed of a series of some 4 to 5 cross wharves or piers running southward or at right angles to the jetty and which, not having to be water tight, could have been built at trifling additional expense and would thus have afforded berths for at least 12 to 20 additional vessels of the largest size ; while the dock as now constructed will hardly admit one of more than 22 ft. draught of water and on the condition that when once in, it must back out to effect an exit.

This is what we are subject to, gentlemen, by confiding such works to outside would be engineers not capable of passing from the narrow waters of the old country where every thing is on the same small scale, to the broader conceptions necessary to enlarge their operations in the ratio of the wider waters of the newer world.

Not that there are wanting English, French or other European engineers or American adequate to the task of designing works for Canada : as Stevenson of the Victoria, Brunelle of the Leviathan, Roebling of the suspension bridge, the engineers of the new Forth bridge in Scotland with its two mighty cantiliver spans of 1700 ft. each ; but that our then harbour commissioners dit not know where to look for them nor who to choose and they are the ones to blame, but recrimination is useless now that the thing is done.

It is then time I say again that we should have men educated here in full view of the difficulties of our climate and whose minds could mature schemes adequate to the scale of our vast inter-oceanic dominion. This can be done gentlemen first by a tuition in a school of art and design and next by their being indentured to a canadian engineer of high standing in active and varied practice like many of those we have honored me this evening with their presence.

(Signed) C. BAILLAIRGÉ,
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City & Civil Engr., Arct. &c.

Quebec, May 1887.

